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SEQUENCE LISTING

<110> ENDO, Keiji et al.

<120> MUTANT ALPHA-AMYLASES

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<140> US 09/590,375

<141> 2000-06-09

<150> JP P1999-163569

<151> 1999-06-10

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<212>PRT

<213>Bacillus sp. KSM-K38

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Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu
50 55 60
Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys
65 70 75 80
Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn
85 90 95
Val Tyr Gly Asp Val Val Met Asn His Lys Met Gly Ala Asp Phe Thr
100 105 110
Glu Ala Val Gln Ala Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp
115 120 125
Ile Ser Gly Ala Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser
130 135 140
Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe
145 150 155 160
Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg
165 170 175
Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn
180 185 190
Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val
195 200 205
Gln Asp Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp
210 215 220
Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr
225 230 235 240
Thr Ser Asp Trp Val Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu
245 250 255
Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe
260 265 270
Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu

275	280	285
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Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Met His Ala		
305	310	315
Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu		320
325	330	335
Ser Trp Val Ala Asp Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu		
340	345	350
Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly		
355	360	365
Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu		
370	375	380
Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe		
385	390	395
Asp His Trp Asp Val Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg		400
405	410	415
Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser		
420	425	430
Lys Trp Met Tyr Val Gly Arg Gln Asn Ala Gly Gln Thr Trp Thr Asp		
435	440	445
Leu Thr Gly Asn Asn Gly Ala Ser Val Thr Ile Asn Gly Asp Gly Trp		
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Asn Leu Lys Ser Lys Gly Ile Thr Ala Val Trp Ile Pro Pro Ala Trp		
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Asp Leu Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly		
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Thr Arg Ser Gln Leu Gln Gly Ala Val Thr Ser Leu Lys Asn Asn Gly		
85	90	95
Ile Gln Val Tyr Gly Asp Val Val Met Asn His Lys Gly Gly Ala Asp		
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Gly Thr Glu Met Val Asn Ala Val Glu Val Asn Arg Ser Asn Arg Asn		
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Gln Glu Ile Ser Gly Glu Tyr Thr Ile Glu Ala Trp Thr Lys Phe Asp		
130	135	140
Phe Pro Gly Arg Gly Asn Thr His Ser Asn Phe Lys Trp Arg Trp Tyr		
145	150	155
His Phe Asp Gly Thr Asp Trp Asp Gln Ser Arg Gln Leu Gln Asn Lys		
165	170	175
Ile Tyr Lys Phe Arg Gly Thr Gly Lys Ala Trp Asp Trp Glu Val Asp		
180	185	190

Ile Glu Asn Gly Asn Tyr Asp Tyr Leu Met Tyr Ala Asp Ile Asp Met
 195 200 205
 Asp His Pro Glu Val Ile Asn Glu Leu Arg Asn Trp Gly Val Trp Tyr
 210 215 220
 Thr Asn Thr Leu Asn Leu Asp Gly Phe Arg Ile Asp Ala Val Lys His
 225 230 235 240
 Ile Lys Tyr Ser Tyr Thr Arg Asp Trp Leu Thr His Val Arg Asn Thr
 245 250 255
 Thr Gly Lys Pro Met Phe Ala Val Ala Glu Phe Trp Lys Asn Asp Leu
 260 265 270
 Ala Ala Ile Glu Asn Tyr Leu Asn Lys Thr Ser Trp Asn His Ser Val
 275 280 285
 Phe Asp Val Pro Leu His Tyr Asn Leu Tyr Asn Ala Ser Asn Ser Gly
 290 295 300
 Gly Tyr Phe Asp Met Arg Asn Ile Leu Asn Gly Ser Val Val Gln Lys
 305 310 315 320
 His Pro Ile His Ala Val Thr Phe Val Asp Asn His Asp Ser Gln Pro
 325 330 335
 Gly Glu Ala Leu Glu Ser Phe Val Gln Ser Trp Phe Lys Pro Leu Ala
 340 345 350
 Tyr Ala Leu Ile Leu Thr Arg Glu Gln Gly Tyr Pro Ser Val Phe Tyr
 355 360 365
 Gly Asp Tyr Tyr Gly Ile Pro Thr His Gly Val Pro Ser Met Lys Ser
 370 375 380
 Lys Ile Asp Pro Leu Leu Gln Ala Arg Gln Thr Tyr Ala Tyr Gly Thr
 385 390 395 400
 Gln His Asp Tyr Phe Asp His His Asp Ile Ile Gly Trp Thr Arg Glu
 405 410 415
 Gly Asp Ser Ser His Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asp
 420 425 430
 Gly Pro Gly Gly Asn Lys Trp Met Tyr Val Gly Lys His Lys Ala Gly
 435 440 445
 Gln Val Trp Arg Asp Ile Thr Gly Asn Arg Ser Gly Thr Val Thr Ile
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ttatgatata tgtaagcgtt atcattaaaa ggaggtatgg atg aga aga tgg gta Met Arg Arg Trp Val	176			
	-20			
gta gca atg ttg gca gtg tta ttt tta ttt cct tcg gta gta gtt gca Val Ala Met Leu Ala Val Leu Phe Leu Phe Pro Ser Val Val Val Ala	224			
-15 -10 -5 -1				
gat gga ttg aac ggt acg atg cag tat tat gag tgg cat ttg gaa Asp Gly Leu Asn Gly Thr Met Met Gln Tyr Tyr Glu Trp His Leu Glu	272			
1 5 10 15				
aac gac ggg cag cat ttg aat cgg ttg cac gat gat gcc gca gct ttg Asn Asp Gly Gln His Trp Asn Arg Leu His Asp Asp Ala Ala Ala Leu	320			
20 25 30				
agt gat gct ggt att aca gct att tgg att ccg cca gcc tac aaa ggt Ser Asp Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly	368			
35 40 45				
aat agt cag gcg gat gtt ggg tac ggt gca tac gat ctt tat gat tta Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu	416			
50 55 60				
gga gag ttc aat caa aag ggt act gtt cga acg aaa tac gga act aag Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys	464			
65 70 75 80				
gca cag ctt gaa cga gct att ggg tcc ctt aaa tct aat gat atc aat Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn	512			
85 90 95				
gta tac gga gat gtc gtg atg aat cat aaa atg gga gct gat ttt acg Val Tyr Gly Asp Val Val Met Asn His Lys Met Gly Ala Asp Phe Thr	560			
100 105 110				
gag gca gtg caa gct gtt caa gta aat cca acg aat cgt tgg cag gat Glu Ala Val Gln Ala Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp	608			
115 120 125				
att tca ggt gcc tac acg att gat gcg tgg acg ggt ttc gac ttt tca Ile Ser Gly Ala Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser	656			
130 135 140				
ggg cgt aac aac gcc tat tca gat ttt aag tgg aga tgg ttc cat ttt Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe	704			
145 150 155 160				
aat ggt gtt gac tgg gat cag cgc tat caa gaa aat cat att ttc cgc Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg	752			
165 170 175				

ttt gca aat acg aac tgg aac tgg cga gtg gat gaa gag aac ggt aat Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn 180	185	190	800
tat gat tac ctg tta gga tcg aat atc gac ttt agt cat cca gaa gta Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val 195	200	205	848
caa gat gag ttg aag gat tgg ggt agc tgg ttt acc gat gag tta gat Gln Asp Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp 210	215	220	896
ttg gat ggt tat cgt tta gat gct att aaa cat att cca ttc tgg tat Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr 225	230	235	944
aca tct gat tgg gtt cg ^g cat cag cgc aac gaa gca gat caa gat tta Thr Ser Asp Trp Val Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu 245	250	255	992
ttt gtc gta ggg gaa tat tgg aag gat gac gta ggt gct ctc gaa ttt Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe 260	265	270	1040
tat tta gat gaa atg aat tgg gag atg tct cta ttc gat gtt cca ctt Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu 275	280	285	1088
aat tat aat ttt tac cg ^g gct tca caa caa ggt gga agc tat gat atg Asn Tyr Asn Phe Tyr Arg Ala Ser Gln Gln Gly Ser Tyr Asp Met 290	295	300	1136
cgt aat att tta cga gga tct tta gta gaa gcg cat ccg atg cat gca Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Met His Ala 305	310	315	1184
gtt acg ttt gtt gat aat cat gat act cag cca ggg gag tca tta gag Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu 325	330	335	1232
tca tgg gtt gct gat tgg ttt aag cca ctt gct tat gcg aca att ttg Ser Trp Val Ala Asp Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu 340	345	350	1280
acg cgt gaa ggt ggt tat cca aat gta ttt tac ggt gat tac tat ggg Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly 355	360	365	1328
att cct aac gat aac att tca gct aaa aaa gat atg att gat gag ctg Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu 370	375	380	1376
ctt gat gca cgt caa aat tac gca tat ggc acg cag cat gac tat ttt Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe 385	390	395	1424
			400

gat cat tgg gat gtt gta gga tgg act agg gaa gga tct tcc tcc aga		1472	
Asp His Trp Asp Val Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg			
405	410	415	
cct aat tca ggc ctt gcg act att atg tcg aat gga cct ggt ggt tcc		1520	
Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser			
420	425	430	
aag tgg atg tat gta gga cgt cag aat gca gga caa aca tgg aca gat		1568	
Lys Trp Met Tyr Val Gly Arg Gln Asn Ala Gly Gln Thr Trp Thr Asp			
435	440	445	
tta act ggt aat aac gga gcg tcc gtt aca att aat ggc gat gga tgg		1616	
Leu Thr Gly Asn Asn Gly Ala Ser Val Thr Ile Asn Gly Asp Gly Trp			
450	455	460	
ggc gaa ttc ttt acg aat gga gga tct gta tcc gtg tac gtg aac caa		1664	
Gly Glu Phe Phe Thr Asn Gly Ser Val Ser Val Tyr Val Asn Gln			
465	470	475	480
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Ser Asn Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly			
35 40 45			
Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu			
50 55 60			
Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys			
65 70 75 80			
Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn			
85 90 95			
Val Tyr Gly Asp Val Val Met Asn His Lys Leu Gly Ala Asp Phe Thr			
100 105 110			
Glu Ala Val Gln Ala Val Gln Val Asn Pro Ser Asn Arg Trp Gln Asp			
115 120 125			
Ile Ser Gly Val Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Pro			
130 135 140			
Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe			
145 150 155 160			
Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Leu Phe Arg			
165 170 175			
Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn			
180 185 190			
Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val			
195 200 205			
Gln Glu Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp			

210	215	220
Leu	Asp	Gly
Tyr	Arg	Leu
Leu	Asp	Ala
Ile	Lys	His
Ile	Pro	Phe
Trp	Tyr	
225	230	235
240		
Thr	Ser	Asp
Trp	Val	Arg
His	Gln	Arg
Ser	Glu	Ala
Asp	Gln	Asp
Leu		
245	250	255
255		
Phe	Val	Val
Gly	Glu	Tyr
Trp	Lys	Asp
Asp	Val	Gly
Ala	Leu	Glu
Phe		
260	265	270
270		
Tyr	Leu	Asp
Glu	Met	Asn
Trp	Glu	Met
Ser	Leu	Phe
Asp	Val	Asp
Pro	Leu	
275	280	285
285		
Asn	Tyr	Asn
Phe	Tyr	Arg
Ala	Ser	Lys
Gln	Gly	Gly
Ser	Tyr	Asp
Met		
290	295	300
300		
Arg	Asn	Ile
Leu	Arg	Gly
Ser	Leu	Val
Glu	Ala	His
Pro	Pro	Ile
His	Ala	
305	310	315
320		
Val	Thr	Phe
Val	Asp	Asn
His	Asp	Thr
Gln	Pro	Gly
Glu	Ser	Leu
	325	330
335		
Ser	Trp	Val
Ala	Asp	Trp
Phe	Lys	Pro
Leu	Ala	Tyr
Ala	Thr	Ile
Tyr	Ile	Leu
340	345	350
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Thr	Arg	Glu
Gly	Gly	Tyr
Pro	Asn	Val
Phe	Tyr	Gly
Asp	Tyr	Tyr
Tyr		
355	360	365
365		
Ile	Pro	Asn
Asp	Asn	Ile
Ser	Ala	Lys
Lys	Asp	Met
Met	Ile	Asp
Glu		
370	375	380
380		
Leu	Asp	Ala
Arg	Gln	Asn
Tyr	Ala	Tyr
Gly	Thr	Gln
His	Asp	Tyr
385	390	395
400		
Asp	His	Trp
Trp	Asp	Ile
Asp	Val	Gly
Trp	Trp	Thr
Arg	Glu	Gly
Gly	Thr	Ser
Arg		
405	410	415
415		
Pro	Asn	Ser
Gly	Leu	Ala
Leu	Thr	Ile
Ala	Met	Ser
Ser	Asn	Gly
Gly	Pro	Gly
	Gly	Ser
420	425	430
430		
Lys	Trp	Met
Tyr	Val	Gly
Gln	Gln	His
His	Ala	Gly
Gly	Gln	Gly
	Trp	Thr
435	440	445
445		
Leu	Thr	Gly
Asn	His	Ala
Ala	Ser	Val
Thr	Ile	Asn
Gly	Gly	Asp
450	455	460
460		
Gly	Glu	Phe
Phe	Phe	Thr
Asn	Gly	Gly
Ser	Ser	Val
Val	Val	Tyr
Ser	Val	Val
Tyr	Asn	Gly
Val	Gly	
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gat ggc ttg aat gga acg atg atg cag tat tat gag tgg cat cta gag 150
Asp Gly Leu Asn Gly Thr Met Met Gln Tyr Tyr Glu Trp His Leu Glu
1 5 10 15

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Asn Asp Gly Gln His Trp Asn Arg Leu His Asp Asp Ala Glu Ala Leu			
20	25	30	
agt aat gcg ggt att aca gct att tgg ata ccc cca gcc tac aaa gga		246	
Ser Asn Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly			
35	40	45	
aat agt cag gct gat gtt ggg tat ggt gca tac gac ctt tat gat tta		294	
Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu			
50	55	60	
ggg gag ttt aat caa aaa ggt acc gtt cga acg aaa tac ggg aca aag		342	
Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys			
65	70	75	80
gct cag ctt gag cga gct ata ggg tcc cta aag tcg aat gat atc aat		390	
Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn			
85	90	95	
gtt tat ggg gat gtc gta atg aat cat aaa tta gga gct gat ttc acg		438	
Val Tyr Gly Asp Val Val Met Asn His Lys Leu Gly Ala Asp Phe Thr			
100	105	110	
gag gca gtg caa gct gtt caa gta aat cct tcg aac cgt tgg cag gat		486	
Glu Ala Val Gln Ala Val Gln Val Asn Pro Ser Asn Arg Trp Gln Asp			
115	120	125	
att tca ggt gtc tac acg att gat gca tgg acg gga ttt gac ttt cca		534	
Ile Ser Gly Val Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Pro			
130	135	140	
ggg cgc aac aat gcc tat tcc gat ttt aaa tgg aga tgg ttc cat ttt		582	
Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe			
145	150	155	160
aat ggc gtt gac tgg gat caa cgc tat caa gaa aac cat ctt ttt cgc		630	
Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Leu Phe Arg			
165	170	175	
ttt gca aat acg aac tgg aac tgg cga gtg gat gaa gag aat ggt aat		678	
Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn			
180	185	190	
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Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val			
195	200	205	
caa gag gaa tta aag gat tgg ggg agc tgg ttt acg gat gag cta gat		774	
Gln Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp			
210	215	220	
tta gat ggg tat cga ttg gat gct att aag cat att cca ttc tgg tat		822	
Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr			
225	230	235	240
acg tca gat tgg gtt agg cat cag cga agt gaa gca gac caa gat tta		870	
Thr Ser Asp Trp Val Arg His Gln Arg Ser Glu Ala Asp Gln Asp Leu			
245	250	255	
ttt gtc gta ggg gag tat tgg aag gat gac gta ggt gct ctc gaa ttt		918	
Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe			
260	265	270	
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Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu			
275	280	285	
aat tat aat ttt tac cgg gct tca aag caa ggc gga agc tat gat atg		1014	
Asn Tyr Asn Phe Tyr Arg Ala Ser Lys Gln Gly Gly Ser Tyr Asp Met			
290	295	300	
cgt aat att tta cga gga tct tta gta gaa gca cat ccg att cat gca		1062	
Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Ile His Ala			
305	310	315	320

gtt acg ttt gtt gat aat cat gat act cag cca gga gag tca tta gaa		1110
Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu		
325	330	335
tca tgg gtc gct gat tgg ttt aag cca ctt gct tat gcg aca atc ttg		1158
Ser Trp Val Ala Asp Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu		
340	345	350
acg cgt gaa ggt ggt tat cca aat gta ttt tac ggt gac tac tat ggg		1206
Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly		
355	360	365
att cct aac gat aac att tca gct aag aag gat atg att gat gag ttg		1254
Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu		
370	375	380
ctt gat gca cgt caa aat tac gca tat ggc aca caa cat gac tat ttt		1302
Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe		
385	390	395
400		
gat cat tgg gat atc gtt gga tgg aca aga gaa ggt aca tcc tca cgt		1350
Asp His Trp Asp Ile Val Gly Trp Thr Arg Glu Gly Thr Ser Ser Arg		
405	410	415
cct aat tcg ggt ctt gct act att atg tcc aat ggt cct gga gga tca		1398
Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser		
420	425	430
aaa tgg atg tac gta gga cag caa cat gca gga caa acg tgg aca gat		1446
Lys Trp Met Tyr Val Gly Gln Gln His Ala Gly Gln Thr Trp Thr Asp		
435	440	445
tta act ggc aat cac gcg gcg tcg gtt acg att aat ggt gat ggc tgg		1494
Leu Thr Gly Asn His Ala Ala Ser Val Thr Ile Asn Gly Asp Gly Trp		
450	455	460
ggc gaa ttc ttt aca aat gga gga tct gta tcc gtg tat gtg aac caa		1542
Gly Glu Phe Phe Thr Asn Gly Gly Ser Val Ser Val Tyr Val Asn Gln		
465	470	475
taataaaaaag ccttgagaag ggattcctcc ctaactcaag gctttcttta tgtcgtttag		1602
ctcaaccqctt ctacqaqct tta		1625

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<220>
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<220>
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<220>
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<220>
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<400>22
taaagcttca atttatattg g 21

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ccagatctac ttaccatttt agagtca 27

B¹